Leptomeningeal cysts associated with traumatic cerebrospinal fluid rhinorrhea

Diagnostic value of scinticisternography

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Nine instances of traumatic leptomeningeal cysts associated with rhinorrhea are described. The authors believe that the consequences of head trauma are responsible for both the rhinorrhea and the formation of leptomeningeal cysts, and that the scintigraphic demonstration of a leptomeningeal cyst may help in diagnosis when no overt rhinorrhea is present.

KEY WORDS • leptomeningeal cyst • rhinorrhea • scinticisternography

SCINTICISTERNOGRAPHY is considered a useful investigation for the demonstration of a CSF leak. However, demonstrating such a leak depends on an actual flow of cerebrospinal fluid (CSF) out of the subarachnoid space during the investigation, and this may not be possible because of the intermittent nature of rhinorrhea. Furthermore, it is not the leakage of CSF which is itself dangerous, but the possibility of ascending bacterial infection due to fractures in the floor of the anterior fossa and paranasal sinuses associated with tears of the meninges, and the establishment of a pathway between the meninges and nasal cavity. Our attention was drawn to the presence of an abnormal accumulation of radioactivity in the floor of the anterior fossa in cases investigated because of suspected rhinorrhea. This accumulation was seen whether or not there was any actual rhinorrhea at the time of the investigation. We are reporting nine such cases.

Analysis of Cases

In all nine cases scintigraphy was performed with 100 μCi radioiodinated human serum albumin, using both a scintillation gamma camera and a rectilinear scanner. Positioning is easier with the gamma camera, and a preliminary study gives a quick general orientation, indicating whether views and positions other than the routine are likely to be helpful. The rectilinear scanner gives a somewhat better resolution in the plane of the

focusing collimator than does the camera; this is especially important in demonstrating median and paramedian cysts in the lateral views. Every patient was studied at 1 to 4, 24, and 48 hours after injection.

Seven patients had experienced flow of CSF from the nose at some time after the accident. The other two patients had had bouts of meningitis which drew attention to the possibility of rhinorrhea, so that scinticisternography was performed. In only three of the seven cases with clinical rhinorrhea was the CSF leak demonstrated by scinticisternography, performed within 2 weeks of the accident. In all nine cases, however, examined between 2 weeks and 27 months after the accident, the average being about 10 months, scinticisternography revealed an abnormal collection of the radiopharmaceutical in the anterior fossa (Table 1). The scintigrams of Cases 1, 2, and 3 are demonstrated in Figs. 1, 2, and 3, and schematic drawings of all scintigrams are shown in Fig. 4.

Discussion

The abnormal local collection of radioactivity is due to the presence of an abnormal amount of CSF, communicating with the CSF spaces. The slow accumulation and marked persistence, as compared with normal CSF flow and absorption, indicate a slow passage of CSF in and out of the abnormal collection. The pathological substrate of the collection is a traumatic leptomeningeal cyst, as described by several authors.5,7,8 Leptomeningeal cysts are abnormal spaces, filled with CSF, over the convexity or at the base of the brain, and resulting from adhesions between the pia mater and arachnoid. These adhesions are caused by local hemorrhage and lacerations of the meninges and brain and may occur in any region of the brain where a fracture of the skull or skull base is associated with a dural tear. Leptomeningeal cysts develop weeks, months, and sometimes years after the trauma.8 Most descriptions pertain to cysts which have caused local erosions of the skull, consisting of an irregular defect with scalloped margins and some sclerosis at the site of an old fracture.

In each of our cases of leptomeningeal adhesions, a tear of the dura and fracture of the floor of the anterior fossa were found at the site of the abnormal accumulation of radioactivity in the scinticisternograms. Demonstration of leptomeningeal cysts by isotope cisternography has been reported by several authors.2,3,5,6 Di Chiro, et al., described a case of leptomeningeal cyst in the floor of the anterior fossa associated with rhinorrhea.2 An abnormal collection of radioactivity in the floor of the anterior fossa associated with rhinorrhea has also been mentioned by others.9,4

In each of our cases there was a com-

Fig. 1. Case 1. Scinticisternography, anterior (left) and left lateral (right) views 24 hours after lumbar injection. An abnormal local collection of radioactivity is seen in the anterior left paramedian region of the floor of the anterior fossa.
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FIG. 2. Case 2. Scinticisternography, anterior (left) and left lateral (right) views 24 hours after lumbar injection. An abnormal collection of radioactivity is seen over the anterior aspect of the frontal lobes and the anterior part of the anterior fossa, especially in the left paramedian region.

municating pathway between the CSF spaces and the nose or paranasal sinuses. However, in only three of the seven cases in which scinticisternography was performed immediately after the accident was there a trail of the radiopharmaceutical leaving the CSF spaces. When scinticisternography was repeated at a later stage, all cases were found to have an abnormal collection of the radiopharmaceutical in the floor of the anterior fossa. Reports of large series are still necessary to evaluate fully the significance of this scintigraphic sign. At present it can be said that it may add to the diagnostic value of scinticisternography in cases where rhinorrhea is suspected, even when actual leakage of CSF is not demonstrated. It should be borne in mind that in some instances a cyst of this sort may grow and gradually erode the floor of the anterior fossa, causing delayed rhinorrhea. The presence of such a cyst may therefore warrant attention in the future.

FIG. 3. Case 3. Scinticisternography, anterior (left) and left lateral (right) views 24 hours after lumbar injection. An abnormal collection of radioactivity is seen in the anteromedial region of the anterior fossa.
TABLE 1

Summary of cases of abnormal accumulation of radioactivity at the floor of the anterior fossa

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (yrs)</th>
<th>Clinical Symptoms</th>
<th>Fractures of Floor of Anterior Fossa (X-ray Film)</th>
<th>Time Interval of Trauma to Scintigraphy</th>
<th>Operative Evidence of CSF Fistula and Cyst*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>+</td>
<td>+</td>
<td>27 mos</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>+</td>
<td>+</td>
<td>13 mos</td>
<td>+</td>
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<tr>
<td>3</td>
<td>36</td>
<td></td>
<td>+</td>
<td>18 mos</td>
<td>no op</td>
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<tr>
<td>4</td>
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<td></td>
<td>+</td>
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<td>+</td>
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<tr>
<td>5</td>
<td>28</td>
<td>+</td>
<td>+</td>
<td>19 mos</td>
<td>+</td>
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<td>17</td>
<td>+</td>
<td>+</td>
<td>2 wks</td>
<td>+</td>
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<tr>
<td>7</td>
<td>18</td>
<td>+</td>
<td>+</td>
<td>6 wks</td>
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<tr>
<td>8</td>
<td>30</td>
<td>+</td>
<td>+</td>
<td>7 wks</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>20</td>
<td>+</td>
<td>+</td>
<td>15 mos</td>
<td>+</td>
</tr>
</tbody>
</table>

*Operative evidence included fracture of floor of the anterior fossa, tear of dura, adhesions.

Fig. 4. Schematic drawings of scintigrams. Numbers refer to cases summarized in Table 1.
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References


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